Patent Claims

1. A process for the multi-stage production of diffusion-brazed joins (1) between a substrate (4) for a carrier underside (3) and a further substrate (5) for a carrier top side (2), which includes the following process steps:
   - coating a first side (2, 6) of a carrier (12) with a first diffusion-brazing alloy (14),
   - coating a second side (3, 9) of the carrier (12) with a second diffusion-brazing alloy (15),

   the melting points of diffusion-brazing alloys (14, 15) and diffusion-brazed joins (16, 17) being staggered in such a manner that a first melting point of the first diffusion-brazing alloy (14) is lower than a second melting point of the second diffusion-brazing alloy (15), and the second melting point being lower than a third melting point of a first diffusion-brazed join (16) produced from the first diffusion-brazing alloy (14),
   - diffusion-brazing a first substrate (4, 8) to the first side (2, 6) of the carrier (12) by heating the first diffusion-brazing alloy (14) to the first melting point,
   - diffusion-brazing a second substrate (5, 10) to the second side (3, 9) of the carrier (12) by heating the second diffusion-brazing alloy (15) to the second melting point.

2. The process as claimed in claim 1, characterized in that a first diffusion-brazing alloy (14) of the composition Ga-yNi where 1% by weight < y < 20% by weight or Ga-xCu where 1% by weight < x < 40% by weight or Ga-yAg where 1% by weight < y < 40% by weight is applied to the first side (2, 6), and a second diffusion-brazing alloy (15)

of the composition In-xAg where 1% by weight < x < 30% by weight or Sn-yAg where 1% by weight < y < 50% by weight is applied to the second side (3, 9).

3. The process as claimed in claim 1, characterized in that a first diffusion-brazing alloy (14) of the composition Ga-yNi where 1% by weight < y < 20% by weight or Ga-yAg where 1% by weight < y < 40% by weight is applied to the first side (2, 6), and a second diffusion-brazing alloy (15) of the composition In-xAg where 1% by weight < x < 30% by weight or Sn-yAg where 1% by weight < y < 50% by weight or Au-xSn where 5% by weight < x < 38% by weight, preferably where 10% by weight < x < 30% by weight, is applied to the second side (3, 9).

4. The process as claimed in claim 1, characterized in that a diffusion-brazing alloy (14) of the composition Ga-yAg where 1% by weight < y < 40% by weight is applied to the first side (2, 6), and a diffusion-brazing alloy (15) of the composition In-xAg where 1% by weight < x < 30% by weight or Sn-yAg where 1% by weight < y < 50% by weight or Au-xSn where 5% by weight < x < 38% by weight, preferably where 10% by weight < x < 30% by weight or Au-yGe where 4% by weight < y < 50% by weight, remainder Au, preferably where 7% by weight < y < 20% by weight, remainder Au, is applied to the second side (3, 9).

5. The process as claimed in claim 1, characterized in that a first diffusion-brazing alloy (14) of the composition In-xAg where 1% by weight < x < 30% by weight is applied to the first side (2, 6), and a second diffusion-brazing alloy of the composition Sn-yAg where 1% by weight < y < 50% by weight or Au-xSn where 5% by weight < x < 38% by

weight, preferably where 10% by weight < x < 30% by weight, or Au-yGe where 4% by weight < y < 50% by weight, remainder Au, preferably where 7% by weight < y < 20% by weight, remainder Au, is applied to the second side (3, 9).

6. The process as claimed in claim 1, characterized in that a first diffusion-brazing alloy (14) of the composition Sn-yAg where 1% by weight < y < 50% by weight is applied to the first side (2, 6), and a second diffusion-brazing alloy (15) of the composition Au-xSn where 5% by weight < x < 38% by weight, preferably where 10% by weight < x < 30% by weight, or Au-yGe where 4% by weight < y < 50% by weight, remainder Au, preferably where 7% by weight < y < 20% by weight, remainder Au, is applied to the second side (3, 9).

7. The process as claimed in claim 1, characterized in that a first diffusion-brazing alloy (14) of the composition Au-xSn where 5% by weight < x < 38% by weight, preferably where 10% by weight < x < 30% by weight, is applied to the first side (2, 6), and a second diffusion-brazing alloy (15) of the composition Au-yGe where 4% by weight < y < 50% by weight, remainder Au, preferably where 7% by weight < y < 20% by weight, remainder Au, is applied to the second side (3, 9).

8. The process as claimed in one of the preceding claims, characterized in that a layer of silver, copper or nickel is applied to each side (2, 6, 3, 9) of the carrier (12) or of the semiconductor chip (13) prior to the application of the diffusion-brazing alloy (14, 15).

9. The process as claimed in one of the preceding claims, characterized in that a layer of copper or

a copper alloy is additionally applied prior to the application of the second diffusion-brazing alloy (15) comprising Au-yGe where 4% by weight < y < 50% by weight, remainder Au, preferably where 7% by weight < y < 20% by weight, remainder Au.

10. The process as claimed in one of the preceding claims, characterized in that a layer (18) of copper or silver or an alloy thereof is applied prior to the application of a diffusion-brazing alloy (14 or 15) comprising Sn-yAg where 1% by weight < y < 50% by weight or Au-xSn where 5% by weight < x < 38% by weight, preferably where 10% by weight < x < 30% by weight.

11. The process as claimed in one of the preceding claims, characterized in that a layer sequence (19) made up of aluminum and titanium is applied prior to the application of a diffusion-brazing alloy (14 or 15) to the sides (6, 9) of a semiconductor chip (13).

12. A power electronic component with a semiconductor chip (13), the rear side (6) of which is brazed to a chip island (7)and which has flat conductors brazed to its contact surfaces on the top side (9) of the semiconductor chip (13), the brazed joins including different diffusion-brazing systems, with a first diffusion-brazing alloy (14) on the rear side (6) and with a second diffusion-brazing alloy (15) on the top side (9), and the first and second diffusion-brazing alloys (14, 15) having different melting points.

13. The power electronic component as claimed in claim 12, characterized in that a metal layer (18) of copper or silver or nickel is arranged between the diffusion-brazing alloy (14, 15) and the side

(6, 9) of the semiconductor chip (13).

14. The power electronic component as claimed in claim 12 or claim 13, characterized in that a layer sequence (19) made up of aluminum and titanium is present on the sides (6, 9) of the semiconductor chip (13).